

DETAILED ACTION

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claim 1-4, 6-10, 12, 15-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Warnes (2003/0022012) in view of Schaeffer (6,123,997).

Warnes teaches a method of forming a thermal barrier including an alumina layer on an aluminide bondcoat (abstract). Warnes teaches the use of a polishing step to apply treat a bondcoat with alumina polishing media [0029].

Though Warner does not explicitly teach the formation of fine scratches on the surface of the substrate prior to film formation, since the steps in the prior art and present claims teach all the same process steps, the results of forming fine scratches on the surface of the substrate obtained by applicants process must necessarily be the same as those obtained by the prior art. Therefore by applying polishing the bondcoat with alumina particles, it must necessarily result in fine scratches on the substrate by Warnes.]

Warnes teaches the formation of an alpha alumina film following the surface treatment [0032].

Warnes teaches the polishing of the bondcoat with alumina, but is silent on the type of alumina particles applied.

Schaeffer teaches a method for forming a thermal barrier coating (abstract). Schaeffer teaches the deposition of a bond coat (col 3, lines 33-38) and then the treatment of the bond coat with alpha alumina particles to drive the formation of a mature alpha alumina film on the bond coat (col 7, lines 20-35). The processing may then include formation of a mature alpha alumina layer (col 7, lines 36-50).

It would have been obvious to someone of ordinary skill in the art at the time of the invention to apply the use of alpha alumina particles to form an alpha alumina film as taught by Schaeffer for the alpha alumina film formation method of Warnes. Since Warnes demonstrably wants to deposit alpha alumina, it would be obvious to apply the same type of particles; Schaeffer demonstrates that the use of alpha alumina particles will drive the production of the same type of film.

Regarding claim 2, the use of alpha particles is taught by Schaeffer.

Regarding claim 3, Schaeffer teaches the use of alpha alumina particles of 0.3 to 5 microns (col 7, lines 30-35). Though Warnes teaches the use of larger alumina particles, one could apply the particle size of Schaeffer as an effective alternative with a reasonable expectation of success in forming an alpha alumina film. The application of the particles by Schaeffer is for inoculation of the bond coat, which is not specifically taught by Warnes, however, one of ordinary skill in the art would apply the particles of Schaeffer as a known alternative.

Regarding claim 6, as noted above, Warnes teaches polishing [0029].

Regarding claim 7, Warnes teaches the use of vibration [0029] to enhance the treatment of the surface, though not specifically teaching ultrasonication, ultrasonication is a range of vibration frequency. The optimization of the frequency would be obvious to one of ordinary skill in the art.

Warnes does not specifically teach the use of a liquid, however, Schaeffer teaches the use of a "slurry" (col 7, 20-35), thereby suggesting the use of particles

within a liquid. One could apply the slurry as taught by Schaeffer with a reasonable expectation of success in treating the surface with alumina particles.

Regarding claims 8 and 9, an alpha alumina film is grown by heating in an oxygen-rich environment (col 6, lines 48-50). The oxygen content is of importance (col 6, lines 1-5) and therefore this clearly constitutes a "gas-phase" (a.k.a. "vapor deposition") growth method.

Regarding claim 10, Warnes teaches forming an alumina film on a bond coated substrate [0032], thereby meeting the requirement of instant claim.

Regarding claim 12, Examiner is taking official notice that a cleaning step prior to a treatment and/or deposition step is well known in the art to remove impurities. Warnes teaches the reduction of surface active impurities prior to forming an alumina film [0024], though not specifically teaching towards cleaning the surface, is demonstrating concern with the surface condition prior to the alumina film formation.

Regarding claim 15, the particles taught by Schaeffer including particles between 0.3 - 1 micron (col 7, lines 34-35); though Schaeffer's teaching of size is not specific to diameter, the size range taught by Schaeffer is suggestive of the size range of the particles of instant claim. Diameter would be one obvious dimension by which the particles of Schaeffer could be measured..

Regarding claims 16-17, Warnes is silent on the thickness of the alumina film. Schaffer teaches that the alumina film is between 0.25 and 6 micron thick, encompassing instant ranges. It would have been obvious to someone of ordinary skill in the art at the time of the invention to apply the alumina film thickness as taught by

Schaeffer as the film provides the same purpose of aiding in the adhesion of a thermal barrier to a bond coat (Schaeffer, abstract; Warnes [0027]).

Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable Warnes (2003/0022012) in view of Schaeffer (6,123,997) as applied to claim 1 above and in further view of Hecht (3,928,026).

The teachings of Warnes in view of Schaeffer are as described above. Schaeffer teaches the use a MCrAlY layer as a bond layer, but not with the composition of claim 4.

Hecht teaches the formation of MCrAlY layer (abstract) and the inclusion of Al, B and C in the alloy (col 2, lines 30-55). It would have been obvious to someone of ordinary skill in the art at the time of the invention to apply the MCrAlY taught by Hecht to the alumina film forming method of Warnes in view of Schaeffer because the alloys stated by Hecht are well known alloys in the art; furthermore Schaeffer teaches that one may use alloys such as those taught by Hecht in his invention (col 3, lines 24-27).

Claims 13 and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Warnes (2003/0022012) in view of Schaeffer (6,123,997) as applied to claim 1 above and in further view of Taira (JP2001-345556, English computer translation).

The teachings of Warnes in view of Schaeffer are outlined above. Warnes and Schaeffer teach the high temperature oxidation of the surface, and do not teach deposition at temperatures as claimed.

Taira teaches a process of seeding an alpha alumina layer by preparing the surface using a PVD layer of chrome oxide prior to forming the alumina layer [0003]. The chrome oxide film has the same crystal structure as alpha alumina and therefore is a favorable pretreatment [0006]. Taira teaches the formation of an alpha aluminum film using reactive sputtering at any temperature from room temperature up to 800 degrees C; Taira also teaches the optional inclusion of oxygen [0011-0014].

It would have been obvious to someone of ordinary skill in the art at the time of the invention to form the alpha alumina film by reactive sputtering at below 800 degrees C as taught by Taira in the alpha alumina film formation process of Warnes in view of Schaeffer as one could use the method of Taira as an alternative to the higher temperature oxidation method with a reasonable expectation of success. The teaching of the pretreatment of the substrate with chrome oxide before sputtering deposition is indicative that the pretreatment taught by Warnes in view of Schaeffer would be beneficial in the case of sputtering deposition in order to control the effective formation of an alumina film that is specifically alpha in phase.

Regarding claim 14, Taira teaches the optional inclusion of oxygen and therefore there is inherently some level of oxidation of the substrate prior to the completion of the film formation. The claim is open to interpretation as some oxidation occurs prior to the completion of the film or, alternatively, since the sputtering process is used, it is inherent that even if the oxygen gas meets the substrate at the same time as sputtered aluminum, the sputtered aluminum will not have covered the entire substrate.

Claim 1, 4, 5 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over in view of Iyori (6,254,984) in view of Warnes (2003/0022012), Schaeffer (6,123,997), as evidenced by Ikeda (Thin Solid Films).

Iyori teaches a multi-layer coated member (abstract), which includes a substrate with a coatings of TiAlN containing carbides, nitrides and elements from Groups 4a, 5a and 6a of the periodic table (col 2, lines 15-33). Iyori teaches a process where a substrate is coated with multiple layers and then an alumina film (col 8, line 64 – col 9, line 2). The alumina coating layer may be alpha alumina.

Warnes teaches a method of forming a thermal barrier including an alumina layer on an aluminide bondcoat (abstract). Warnes teaches the use of a polishing step to apply treat a bondcoat with alumina polishing media [0029]. Warnes teaches the formation of an alpha alumina film following the surface treatment [0032]. Though Warner does not explicitly teach the formation of fine scratches on the surface of the substrate prior to film formation, since the steps in the prior art and present claims teach all the same process steps, the results of forming fine scratches on the surface of the substrate obtained by applicants process must necessarily be the same as those obtained by the prior art. Therefore by applying polishing the bondcoat with alumina particles, it must necessarily result in fine scratches on the substrate by Warnes.

It would have been obvious to someone of ordinary skill in the art at the time of the invention to apply the method of forming an alpha alumina film taught by Warnes to

the alumina film formation method of Iyori as it would provide one with an alternative method of effecting the formation of an alpha alumina film.

Ikeda teaches that a TiAlN film can produce an alumina film when oxidized (abs), thereby allowing for the method of Warnes, which teaches towards an oxidation process of forming the alumina layer, to be applicable to the process of Iyori.

Warnes teaches the polishing of the bondcoat with alumina, but is silent on the type of alumina particles applied.

Schaeffer teaches a method for forming a thermal barrier coating (abstract). Schaeffer teaches the deposition of a bond coat (col 3, lines 33-38) and then the treatment of the bond coat with alpha alumina particles to drive the formation of a mature alpha alumina film on the bond coat (col 7, lines 20-35). The processing may then include formation of a mature alpha alumina layer (col 7, lines 36-50).

It would have been obvious to someone of ordinary skill in the art at the time of the invention to apply the use of alpha alumina particles to form an alpha alumina film as taught by Schaeffer for the alpha alumina film formation method of Warnes. Since Warnes demonstrably wants to deposit alpha alumina, it would be obvious to apply the same type of particles; Schaeffer demonstrates that the use of alpha alumina particles will drive the production of the same type of film.

Regarding claims 4 and 5, all elements of the substrate are taught per above.

Regarding claim 11, all limitations of claim 11 are address per the combined teachings above.

Response to Arguments

Applicant's arguments with respect to claims 1-11 have been considered but are moot in view of the new ground(s) of rejection.

Applicants have overcome objections to the specification as well as all previous 102 rejections. The prior art previously applied has been used in part(s) as applied to 103(a) rejections in light of the amended claims.

It is further noted that the teachings of Schaeffer lack only the application of a polishing compound in a manner that causes scratches on the surface. Due to amendment, Warnes has been applied with Schaeffer as a secondary reference, though a reverse argument could potentially be applicable as well since Schaeffer teaches the use of polishing compounds and polishing is an obvious manner of applying such compounds.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the

shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to JOSEPH MILLER JR whose telephone number is (571) 270-5825. The examiner can normally be reached Mon - Thurs, 7am to 6pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Timothy Meeks, can be reached on 571-272-1423. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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